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MAY 1959

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Here is some advance notice of new charts we will be offering in the next issue of DATA. These charts have just come back from the printer and are in stock now.

				accurate as of
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___	C-47	DEPT DEFENSE	APPROPRIATION FY 1960 SHOWING CONVERSION FROM FY 1959 PATTERN	16 Feb 59
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During the month of April, DATA revised the following staff directory charts: All "C" charts below are $2 each.

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___	C-8	ARPA (ADVANCED RESEARCH PROJ AGENCY)	1 May 59
___	C-9	US ARMY SIGNAL CORPS, WASHINGTON AREA	20 Apr 59
___	C-14	NAVY BUREAU OF AERONAUTICS	1 Jun 59
___	C-15	NAVY BUREAU OF SHIPS	1 Jun 59
___	C-30	AIR MATERIEL COMMAND	1 May 59

Also during April, DATA began offering its DATA OUTLINE OF DEFENSE OBJECTIVES, or DODO Book, which is derived from 15 directives of the Department of Defense and is a very complete guide to all functions of the Department of Defense, its relationship with the Joint Chiefs, ARPA, etc.

___ D-1 DODO BOOK $15.00

At the request of several DATAGRAF users, we present below a complete list of all DATA charts and reports showing the dates of last revision:

Quantity	Number	Title	Price	Date of last revision
___	C-1	Who's Who in SECDEF	$2	1 Apr 59
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(continued on next page)

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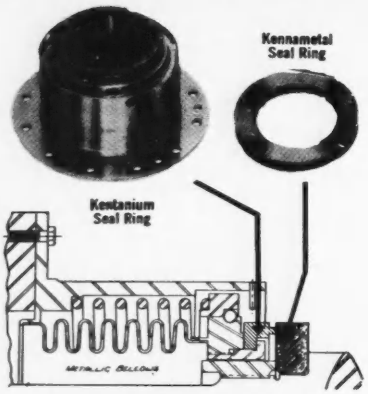
GOVERNMENT RESEARCH AND DEVELOPMENT data

THE UNDERSEAS WARFARE ADVISORY PANEL REPORT 4

WASHINGTON REP REPORTS 17

NEW DATAGRAF CHARTS .23



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OUR COVER

Aerojet-General Corporation's Hydrocket, a new water jet engine, will propel future boats at speeds never before thought possible. The Hydrocket is a new concept in marine propulsion and replaces the propeller with an impeller. The impeller is a metal disk pierced with more than twenty slanting holes. Geared to a conventional gasoline engine's drive shaft, it spins at a terrific speed and pumps water up through a scoop at the bottom of the boat. The water, forced through the nozzles, exits in a whirling spray pattern and drives the boat forward. The boat can be steered by either a rudder or by vanes which deflect the jet spray. When the boat is underway, the Hydrocket rides clear of the water, thus reducing water drag and cavitation.

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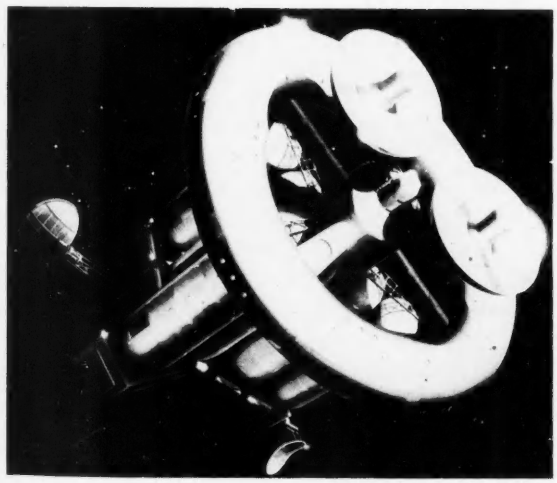
EDITORIAL
by Martin Caidin

RUSSIAN SPACE PLANS AND PROGRESS

Down at places like Cape Canaveral, Vandenberg Air Force Base, and other installations where missile and space flight business is official rather than conversational, the talk these days is of what will the Russians do next? With the tremendous accomplishment behind them of Sputniks II and III and of Mechta, it is recognized that the Soviet Union has in its hands the capability for blazing new trails in the fledgling science of astronautics.

From past performance and from the convincing conversation of Russian scientists, there seems little question but that the moon is in for some more serious attention by Russian deep-space probes. Mechta has been regarded as a probe which missed the moon by accident; yet, more and more engineers have taken a second hard look, and are leaning to the belief (based on flight characteristics of Mechta and of what astronautics science needs badly) that Mechta never "missed" the moon at all. Instead, terminal guidance in the payload sent it past the moon at 2187 miles from the surface (this is the corrected distance released by Moscow) at high velocity before it disappeared on its solar journey.



Painting by Fred L. Wolff

Soviet design *for a major manned space station is projected six to ten years into future. Design calls for more than 100 permanent personnel, self-contained solar power units with nuclear backup.*

Astronomers working on the problems of planetary probes are hampered seriously by lack of a truly accurate measurement of the Astronomical Unit. Before probes can be fired with accuracy to the planet Venus, for example, its necessary to know exactly the distance in orbit of Venus from the sun, and we simply don't know with great accuracy. The Astronomical Unit, which is our solar system yardstick, isn't accurate enough. Indeed, one of the reasons for a planetary probe is to measure the AU to the desired accuracy which astronomers clamor for.

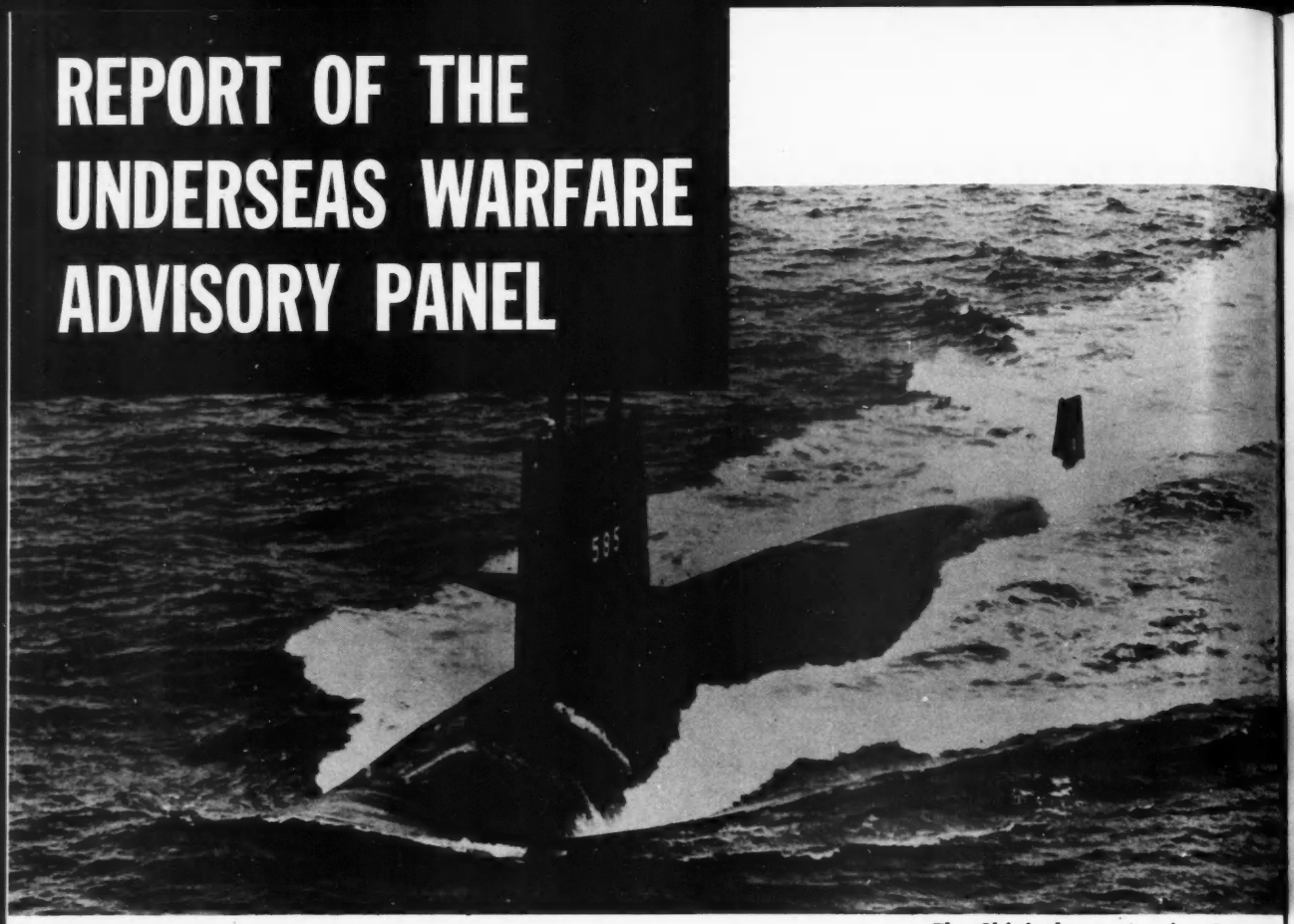
If Mechta truly was such a vehicle, then the Russians have another excellent headstart on our space programs, by having the data necessary with which to fire a Venus probe with much greater accuracy than does the United States. Under present computations, one of our probes will be fortunate indeed to come within 150,000 miles of Venus.

This is good shooting over the mileage involved, but it doesn't pay off in scientific reward — not the kind that will tell us much about Venus, anyway.

With Sputnick III and Mechta behind them more lunar probes of giant size and of extraordinary accuracy are in store. Probes to orbit the moon, to impact the moon, and, before too long, to accomplish a soft landing on the moon, are all within existing Russian capability. Mechta carried all the payload necessary to replace its massive instrument weight with the equipment necessary to place a small instrument package on the surface of the moon, where it will play its mournful beep-beep tune to all the world.

If this occurs before we take some more giant steps into space, the United States and the free world are going to be in for another serious propaganda drubbing. Its bad enough that out of five lunar shots, only one made it, and that couldn't get closer than 37,000 miles to the moon. A Russian probe sitting on the lunar surface with its raucous electronic cry seems in the offing. ●

REPORT OF THE UNDERSEAS WARFARE ADVISORY PANEL



The Skipjack, atomic submarine

FINDINGS

1. The time is rapidly nearing when the Soviet Union can possess, first a few, and then a large fleet of intermediate range ballistic missile-launching nuclear-propelled submarines.

2. The Soviets could mount a devastating nuclear warhead attack from the sea against the United States early in the 1960's.

3. Our existing defensive system could not stop such a missile attack.

4. No weapons system now in existence, even on an experimental basis, offers an adequate defense against nonsnorkeling submarines which run quiet and deep.

5. It is very doubtful whether the present scale and scope of research and development in undersea warfare will give us an effective defense against nuclear submarines in time to meet the threat.

6. Although defense against Polaris-type submarines may soon equal the problem of air defense in urgency, the funding of research and development in support of operational requirements for ASW has been grossly inadequate when compared with the support given such programs as air defense or missile development.

7. Too little research and development effort in the Navy is now directed toward major or order of magnitude improvements in weapons systems.

8. Basic scientific research in fields of great concern to undersea warfare but not immediately related to operational requirements has also been inadequately funded.

9. Basic research in oceanography is in particular now inadequately supported.

10. There is also urgent need for a major step-up in our program of oceanographic surveys.

11. The resources of universities, private research centers, and industry have not been adequately employed or developed for studying and solving undersea warfare problems.

12. The element of concealment gives the nuclear submarine a tremendous advantage over surface ships. Nuclear submarines will grow rapidly in importance in naval warfare - defensively in ASW and escort operations, and offensively in the destruction of commerce and Polaris-type systems.

13. Assuming no modification of our present and planned submarine-construction program, we believe that the Soviets will have it

within their capability if they so desire to build a larger nuclear submarine fleet than our own by the mid-1960's.

14. The Polaris system possesses unique advantages as a deterrent force, and it is a matter of national importance that a force of Polaris submarines be brought into being at the earliest possible date.

15. The Polaris system will be a part of our national military deterrent against all-out war, and should be funded accordingly. It should be considered as outside the Navy's personnel and budget ceilings.

16. We have moved too slowly in developing nuclear weapons specifically optimized for ASW work, and in securing precise quantitative data concerning the effects of underwater nuclear explosions.

17. The bureau system of the Navy has serious shortcomings in the present era of highly integrated and complex weapons systems.

RECOMMENDATIONS

1. The Navy's research and development budget for systems immediately relevant to undersea warfare should be at least doubled in fiscal year 1959, and substantially and continually increased thereafter.

2. There should be a substantial and continuing increase in the Navy's budget for basic research not immediately related to operational requirements. The funding of both basic and applied research should be determined by the availability of qualified scientists and institutions, and should be designed to stimulate the continued orderly growth of universities, private research centers, and industries which can contribute to the solution of our long-range problems in undersea warfare.

3. Basic research in oceanography should in particular receive increased support.

4. The appropriate committees of the Congress should give serious consideration to increasing substantially the moneys available for oceanographic survey work, both on the high seas and in distant coastal areas.

5. The Navy should, as soon as possible, move to employ far more fully than in the past the resources of universities, private research centers and industry to carry out both the basic and applied research on the problems of undersea warfare.

6. The rate and scale of out attack submarine construction program should be significantly increased.

7. The Navy should immediately proceed with the construction of an initial task unit of nine Polaris submarines, and authorization and appropriations for this purpose should be requested of the present session of the Congress.

8. The Polaris system, for funding purposes, should be entirely removed from the Navy's shipbuilding budget.

9. Construction budget requests for the Polaris system should be determined by the Secretary of Defense and the National Security Council, as part of our overall strategic deterrent budget.

10. The Navy and the Atomic Energy Commission should increase their efforts to develop new nuclear weapons specifically optimized for underseas warfare.

11. The Atomic Energy Commission and the Department of Defense should perform such additional underwater test shots as are needed to augment weapons effects data, to increase weapons efficiency, to improve ship design, and to minimize the size and yield of weapons required for ASW work. Such tests should of course be performed in a manner consistent with keeping radioactive contamination and fallout to a minimum.

12. A limited number of vertical management organizations, under officers reporting directly to Chief of Naval Operations, should be established for projects like ocean surveillance systems and attack submarine systems.

II. THE PROBLEM

The oceans of the earth are neutral.

They take no sides in struggles between men, faiths, and nations.

Yet for 150 years after the founding of our Republic, America regarded the ocean as its ally.

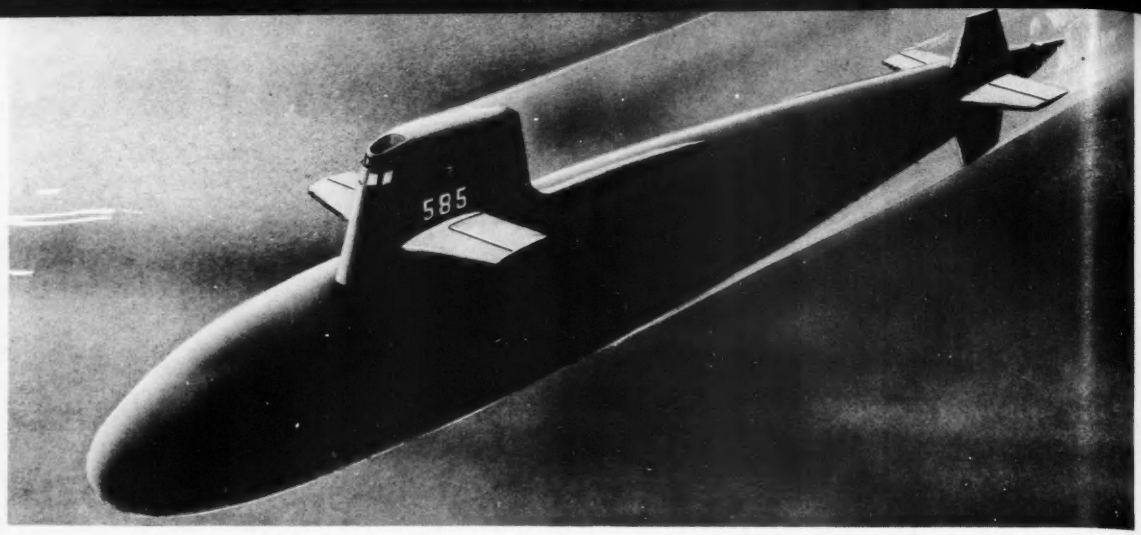
In time of peace, the Atlantic and the Pacific insulated us from the quarrels of Europe and Asia. In time of war, these same oceans shielded our country against direct enemy attack. They were a vast highway for our Armed Forces. Over them, men and material were transported to battlefields far removed from our own cities and factories and farms.

But in the First and Second World Wars, the ocean appeared in different guise. We saw it now as our enemy, as well as our friend. Twice, the submarines of Germany, sheltered in the depths of the Atlantic, almost defeated the Allied coalition.

In a future war, the ocean could be our enemy as never before.

Two new elements have been introduced into naval warfare - the nuclear-propelled submarine, and the submarine-launched intermediate-range ballistic missile.

An attack by a single Polaris-type sub-



The Skipjack, atomic submarine

marine, which might carry 16 or more missiles with hydrogen warheads, could decimate several of our cities. A massive attack with such weapons could level our entire urban society.

The day is rapidly nearing when the Soviet Union can possess, first a few, and then a large fleet of intermediate-range ballistic missile-launching nuclear-propelled submarines.

Our existing and presently planned defensive system could not stop such a missile attack. Therein lies the peril.

But side by side with this, the ocean can still be our friend, as never before. A fleet of missile-launching nuclear submarines in our own hands could inflict devasting reprisal against an aggressor in the event of all-out war. It could become a mainstay of our national deterrent force. Therein lies the opportunity.

In this mid-20th century, we therefore face three problems in undersea warfare. One problem is old; two are new.

First, how best to carry out the traditional mission of our Navy? The free-world alliance system is essentially a maritime confederation. Its survival depends on the free transport of materials and people across the oceans and on the control of areas near sea coasts.

Today, as in the past, our Navy must still do its traditional job of keeping the oceans open for friendly ships, and bringing superior concentrations of power to bear on coastal areas in other regions of the world.

Second, how best to protect the cities, factories, and military installations of our homeland against the threat of missile-launching submarines? In a few years, the threat of strategic attack from the sea may equal in danger the threat of attack from land-based manned bombers and intercontinental missiles.

Third, how best to exploit the new power of submarine-launced missiles to increase our deterrent strength? How best to develop, build, supply, maintain, and operate a fleet of nuclear missile-launching submarines.

III. THE PERIL—TODAY AND TOMORROW

The antisubmarine warfare problem at present centers around detecting, identifying, localizing, and, if necessary, destroying on very short notice the units of an extremely large Soviet conventional submarine force consisting of about 475 vessels.

At the height of World War II, we confronted 440 German U-boats not equipped with schnorkels, with limited underwater endurance, and with an underwater speed not exceeding 12 knots. Operating against this force we had a total of 950 ocean going escorts and 2,200 ASW aircraft.

This compares with about 300 escorts and about 700 ASW aircraft operating today against Soviet submarines of much greater capability.

Because of increased capability of the modern submarine, we could not produce or man the number of planes and ships which would be required to defeat these submarines by the tactics and methods of World War II. We must thus depend heavily on such concepts as ocean surveillance, the barrier or picket concept, and the coordinated hunter-killer team with long-range sonar and high mobility aircraft which can carry the battle to the enemy.

The protection of shipping is of prime importance in a limited war. In such a situation, we may be prevented by policy from attacking the enemy's home submarine bases or his production centers.

It follows that the destruction of such bases should not be considered as part of our ASW strategy except in the event of all-out war.

If all-out-war broke out within the next

2 years, the Soviet diesel-electric submarine fleet could inflict very severe damage against allied naval forces and shipping.

(Classified deletions.)

We must presume that the Soviets will soon possess nuclear submarines which can fire ballistic missiles. The threat from the sea against our cities may assume completely new, and more ominous, dimensions beginning about 1962.

(Classified deletions.)

Their capability in this area should increase rapidly thereafter.

(Classified deletions.)

Our present main line of surveillance and defense is relatively close to our own coasts. To counter the threat of missile-launching submarines we must develop and maintain secure barriers against them at distances from our coasts greater than the range of their missiles. Only thus can we reestablish the oceans as a protective moat around our shores.

To summarize: Nuclear-propelled missile firing submarines will be vastly more difficult to destroy than conventional craft - and far more deadly. Furthermore, kill rates which would be tolerable for meeting the threat to shipping would be unacceptably low for countering the underwater missile threat.

Unless adequate countermeasures not now in existence become available, the Soviets could mount a devastating nuclear warhead attack from the sea against the cities of the United States early in the 1960's.

IV. THE OPPORTUNITY—THE POLARIS SYSTEM

Our Navy is now developing at top priority the Polaris weapon system. This system combines the destructive power of nuclear warheads and the hypersonic speed of ballistic delivery vehicles with the endurance and stealth of nuclear-propelled submerged launching platforms.

The superior nature of the Polaris system should be obvious.

First, it is relatively immune to surprise attack. Units of a Polaris fleet could move and be stationed submerged anywhere over millions of square miles of ocean and still be within striking distance of enemy targets.

Second, it enormously complicates the defensive problems of an enemy. It could launch a counterattack against the Soviet Union from anywhere over an arc of 270 degrees. Vast expenditures of money would be needed to entertain serious hope of neutralizing a Polaris fleet before it could accomplish its mission. Moreover, the relative lack of access of the Soviet Union to the oceans makes their problem of defense against this system more difficult than ours.

Third, it would be based on the empty ocean. It would operate hundreds or thousands of miles removed from the cities, industries, and the land military installations of our own country and our allies. An enemy attack against a land-based deterrent would draw bombs toward our civilian populations, exposing them to the lethal effects of nuclear weapons including radioactive fallout. But an attack against units of the Polaris system would not necessarily draw bombs to our heart land.

Fourth, it could help strengthen the free world alliance system. It would give our allies an alternative to a land-base deterrent force located in densely populated nations. It would make them better able to resist threats of "ballistic blackmail."

While not entirely invulnerable, a fleet of Polaris submarines is much less vulnerable than any other foreseeable deterrent system, and could be countered only by a tremendous diversion of research and industrial effort on the part of the enemy.

It thus adds immensely to our deterrent strength, and it is a matter of national importance that such a fleet be brought into being at the earliest possible date.

V. RESEARCH AND DEVELOPMENT

Research and development related to the detection, identification, localization and destruction of submarines has been supported on a much more modest scale than other national defense activities, such as air defense. This is so despite the fact that the defense against the Polaris type submarine may soon be of equal urgency with air defense.

It requires about 10 years to get a new weapons system into fleet use. Even if this lead time were reduced to 5 years, our situation with respect to undersea warfare would still be serious. There is now no weapons system in existence, even on an experimental basis, capable of coping with a non-snorkeling submarine which runs quiet and deep.

Underwater research generally is costly, slow, and unglamorous. Consequently it has failed to attract either the financial support or the people drawn to fields easier to dramatize. Few universities for example, carry on research or instruction in oceanography, while research in underwater acoustics is almost

the exclusive province of Government laboratories. A bold program of construction of new facilities both for oceanography and acoustics could bring many new scientists into the field.

Much of the research and development money now available is devoted to small stepwise improvements in existing weapons systems and techniques. Although a certain proportion of the research budget is set aside for longer range 'free-wheeling' type research, not enough money is available in any one place at any one time to support really bold and radical proposals requiring extensive new facilities.

It should be obvious that multiple approaches in research are necessary, and that at this stage more than one approach to the same operational requirement should be explored. Such apparent duplication is not wasted. On the contrary, true waste comes from manufacturing ineffective weapons, and from rushing prematurely into the production of inadequately engineered and untested equipment.

While there is reason to feel that research and development money is not now being spent as efficiently as possible, there is overwhelming evidence that the funds available are not adequate to meet the minimum needs of the Navy.

We cite five examples of critically important programs which should be prosucuted more vigorously.

1. Development of Systems to Utilize Underwater Sound Phenomena

For the detection of submerged submarines, underwater sound seems to be the primary tool. The oceans are more transparent to sound than to any other form of energy; in fact, sound travels underwater over great distances. Under certain conditions present listening equipment is capable of obtaining a moderately accurate bearing on a fast moving or snorkeling submarine at about 100 miles. But this information by itself may prove to be of little value as a basis for action. This is not only because of the probable ease of jamming the listening devices, and because of their ineffectiveness against slower moving or deeper running submarines, but also because of the difficulties of localizing and tracking detected objects, and monitoring and coordinating attack units.

Active sonar techniques operating at low frequencies offer considerable theoretical promise, but except for very scattered and incomplete research information, the possible systems using active low frequency echo ranging exist almost entirely on paper, and we cannot even be certain that they offer an answer.

Intensive research in underwater sound is needed both to determine how much further improvement is possible in passive listening, and to determine the potentialities and requirements for active systems. Such research will require large hydrophone installations with associated shore-based equipment, and will also require research ships with expensive acoustic installations and submarine targets available on a continuous basis. The funds presently available for this type of work alone could easily be more than doubled, including investment for new experimental installations, without duplication or waste.

2. Communications

Perhaps the single most important obstacle to the widespread use of submarines for ASW work and as missile launchers is the difficulty of communicating across the airwater interface, as well as underwater. This applies to communications between a submerged submarine, on the one hand, and shore installations aircraft, surface ships, and other submarines on the other.

There is now no sure, reliable, and efficient way of effecting such communication.

3. Oceanographic Surveys

The operational use of nuclear powered deep-running "true submarines' (for example, in the Polaris system) and the development of counter measures against these, including detection, identification, tracking, and attack, will inevitably require a far greater knowledge of the ocean waters and the underlying sea floor than we now possess. At present, even roughly accurate maps of the deep sea floor exist for only about 2 percent of the total ocean area. The modern Navy must also be prepared to operate off the coasts of any part of the earth. This requires a working knowledge of environmental, meteorologic, oceanographic, and topographic conditions in offshore areas throughout the world which is at least as good as that of our potential enemies. Such knowledge is now almost lacking in many regions.

The IGY program has temporarily stimulated oceanographic activities. However, unless more support is given these activities independently of IGY programs, we will sink back to the pre-IGY level in 1959.

Continued on page 19

DEADLINE DATA

SUMMARY DATA:

- SNAP III, a device for converting directly into electricity the radiation emitted by radioactive material, was dvlpd by AEC's Systems for Nuclear Auxiliary Power (SNAP) program. SNAP III is 4¾ in. in diameter, 5½ in. high, 5 lb, with 5-watt power. Objective of SNAP program is the dvlpmnt of sources of auxiliary elec pwr for missiles space systems. ///AEC B-61/
- MARK 44 TORPEDO is part of Navy's stepped-up underwater ord program against Soviet sub threat; Mark 44 is lightweight underwater homing torpedo, electrically propelled, can be launched from a/c and surface ships.
- BULLPUP air-to-surface missile now operational in Navy fleet; is 1st guided missile which requires no checking from factory to firing. Total weight is 540 lb, with 250-lb non-nclr warhead; 11 ft long, 1-ft diameter.
- GENIE MB-1 is Douglas air-to-air rocket, capable of over Mach 4; to be delivered to NAADC for abt $7,000 each, or $250,000 with nclr warhead.
- T2J-1 JET TRAINER, being produced by NAA under $19,300,000 Navy contract, is pwrd by Westinghouse J34 jet engine; has 3,400-lb thrust, with top speed of abt 500 mh and rocket-propelled emergency escape sys.

USSR AIDS US IN NEW MINERAL DISCOVERY

A gift of USSR-discovered labuntsovite by a Soviet scientist enabled US geologists to identify unknown mineral found in Wyoming as labuntsovite. Soviet specimen was brought to US expressly to compare it with the unidentified Wyoming mineral. US Geological Survey called the gift "a remarkable illustration of international cooperation." So far the mineral has no known economic importance. ///UPI /

HOLES IN JET AIRCRAFT NAVIGATION SERVICES

An ICAO committee sees essential needs in air navigation services for jet aircraft: 1) more rapid improvement of aerodromes and extension of runways, 2) great efforts to improve aeronautical fixed telecommunications network, vhf en route air/ground coverage, and navigational aids such as VOR, 3) heavy program of personnel training. Employment of operating agencies is one suggested solution. ///ICAO 27459/

MULTI-MILLION DOLLAR CONTRACT STILL HUSH-HUSH

Details of the special pwr device for B-70 intercontinental bomber, to be dvlpd and mfgd by Beech A/C for SAC, are still withheld. NAA anticipates that over 70% of B-70 proj will be subcontracted. ///NAA NL-33/

SHILLELAGH DATA

Army's latest guided missile, SHILLELAGH, expected to be operational mid-1960, is light-weight, surface-to-air with increased firepower against armor, troops and field fortifications, and has vehicle-mounting application. Total cost expected to be $23 million. Aeronutronics Systems of Calif will begin dvlpmt soon. ///DOD 432-59/

ACCEPTABLE A-RADIATION NOT SO ACCEPTABLE

Studies show that the "maximum permissible concentration" of radioactivity in food is dangerous. Among other dangers, it may increase the incidence of leukemia by over 20%. ///WP&TH/

HOPEFUL OUTLOOK FOR MISSILE MAIL; TEST ALREADY MADE

In the modern age of "helicopter commuters" and "flying fuller brush men" it appears that a large chunk of the R&D appropriation to the Post Office will go to purchase of old winged and perhaps ballistic missiles. Sys has been tested with mail in nose cone of a 9000-mph missile. After negotiations with Def Dept, Post Office hopes to send mail "within hours from New York to Calif, England, India or Austria by guided missiles." ///DATA/

MARITIME ADM TURNS TO SMALL STEAM TURBINES

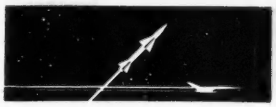
After procurement of 3 gas turbines (1 open-cycle, 1 closed-cycle, 1 free-piston engine) the Federal Maritime Administration reports it is "now out of gas turbine procurement" and will concentrate on evaluating present installations to see the advantages of gas over the steam turbine. However, FMA reports that it is "regularly in the market for steam turbines. In nuclear research we have also not gone beyond the employment of turbines. If we build more nuclear ships we will need even more steam turbines." ///DATA/

EAST AND WEST COMPETE FOR $35-MILLION CONTRACT

Todd Shipbuilding of San Francisco and Newport News Shipbuilding of Va. compete for the Maritime Administration's $35-million shipbuilding contract. Bids opened late last month, award to be made soon.///DATA/

SUMMARY DATA ON DEFENSE DEPT BMEWS FACT SHEET

AF's Ballistic Missile Early Warning Sys (BMEWS) is an electronics sys hoped to provide detection and early warning of enemy ICBM attack in 15 min. Sys uses huge radars able to detect missile 3000 mi away. Power required for 1 station would meet electrical needs of a small city. Three BMEWS stations are involved, but locations of only 2 (Thule, Greenland, and Clear, Alaska) have been announced. Thule will be 1st to become operational. Work on both stations is on or ahead of schedule. Cost of these 2 stations alone will exceed $800 million. Each BMEWS station, tied in with SAGE, will use existing communications sys, such as the DEW Line, to the max. In this way instantaneous warning will be flashed to ADC operational elements. Detection-sys prime contractor, RCA, will provide manpower to operate stations for 1st 2 yrs after completion. Prime contractor for communications sys is Western Elec Co. Overall prog to be under the AF Ballistic Missile Div. Constr to be supervised by Army Engr. Equip to be used is larger and more complex than any before produced, and over 200 suppliers in over 20 states are furnishing materials or services. Major suppliers are: GE, Goodyear A/C, Continental Elec, D.S. Kennedy, Andrews Corp, Varian Assoc, Eitel McCullough, Simplex Wire & Cable.///DOD 43359/



AIR/SPACE

NEW ATOMIC-POWERED AIRSHIP

Goodyear A/C and Navy plan a huge, semirigid airship, capable of over 400 mh, with nclr-driven jet engines far from cockpit and quarters, thus eliminating need for heavy radioactivity shields. ///NsWeek 27459/

CHANCE VOUGHT GETS FIRST SPACE CONTRACT

CVA will build airframe and integrate the 4 all-solid rocket stages of Proj Scout Vehicle in a $945,000 contract with NASA. Low-cost Scout will put 150-lb satellites into 300-mi orbits. ///NASA 59-120/

UK'S FLYING SAUCER UNDERGOES MORE ADDITIONS

More sophisticated versions of England's Hovercraft aircraft-ship will feature elec-stabilized controls, automatic pilot and elec altitude adjustments for wave variation. Supported on a cushion of air, the Hovercraft will skim across sea's surface without touching it. ///Fairchild News/

AF CONTRACTS FOR F-84 TAILPIPE MODIFICATION

Republic A/C will increase the diameter of the F-84F and RF-84F tailpipe nozzle to accommodate increased jet exhaust. ///Republic Av/

AEROJET LAUNCHES PROJ ON LONG-RANGE SOLID ROCKET

Keeping its faith in solid fuel propulsion, Aerojet has launched a $250,000 feasibility study on a one million-lb thrust solid fuel rocket motor, 4 times as powerful as any existing US solid-fuel rocket motor. Study will be preliminary to 10 or 15-lb thrust rockets for Aerojet. ///Aerojet 32-59/

NAVY AWARDS $41 MILLION IN CONTRACTS TO BENDIX FOR TALOS

Bendix A/C has rcd from Navy guided missile contracts totaling over $41 million. One contract, for appx $28.3 million, is for production of TALOS; 2 others, for abt $13 million, are for TALOS engr and procurement of prototype missiles. ///DOD 45759/

NASA CONTRACTS OVER $10 MILLION

Among recent NASA contracts are: (1) to GE for 2nd stage, liquid-propelled Atlas engine (2) to Bell A/C for feasibility study of hi-energy flourine liquid hydrogen rocket engine (3) to Army SigCor for infra-red radiation and heat-balance experiment in Proj Tiros, a meteorological satellite with 2 TV cameras. Other NASA contracts are for: ten 2-stage Nike-ASP sounding rockets; R&D on advanced TV space cameras; meteorological analyses; test equip for telemetry stations; Proj Mercury ground transport; liquid-hydrogen trailer to support hi-energy rocket work; hi-energy recruit rocket motors; Proj Mercury landing and recovery sys; five 3-channel miniature airbrn tape recorders. ///NASA 59-120/

BOEING AND CANADA

Boeing asks 100 Canadian firms to bid on subcontracts; recently awarded Canadair a $1,700,000 contract for wings and control surfaces of Bomarc.

C-50 AIR FORCE BALLISTIC MISSILE DIVISIO

AIR FORCE BALLISTIC MISSILE DIVISION
INGLEWOOD, CALIFORNIA

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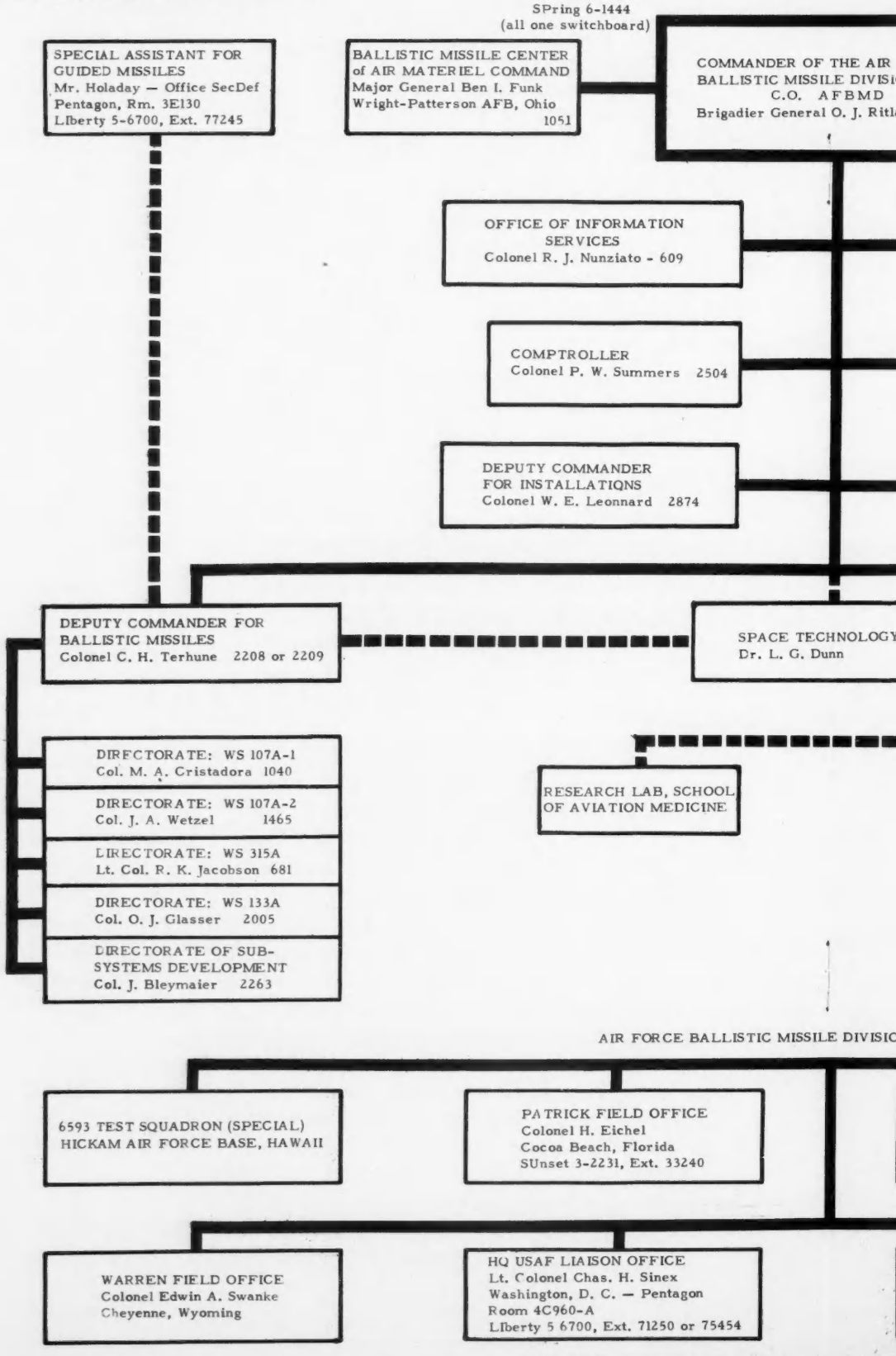
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SPACE TECHNOLOGY
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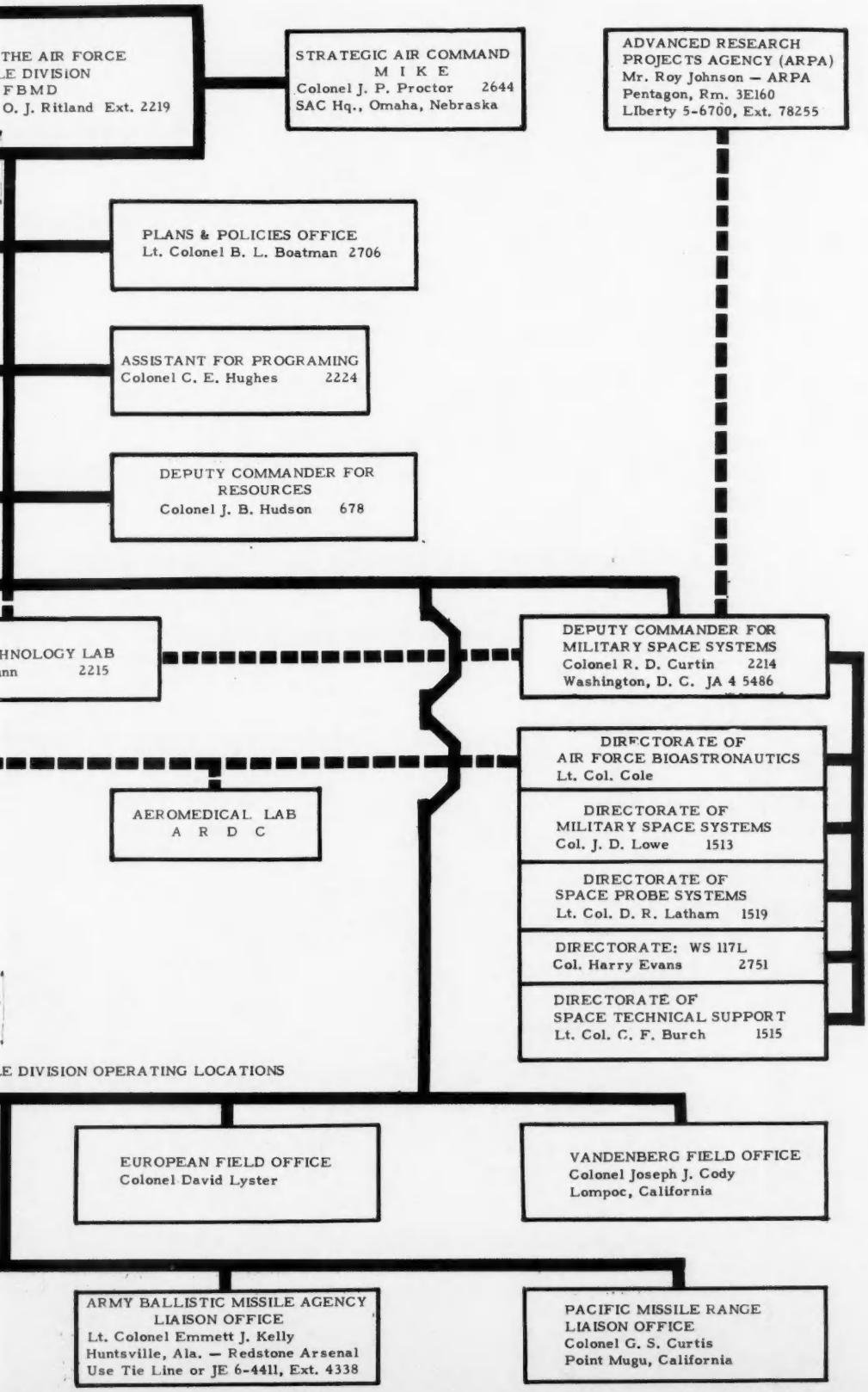
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SPACE PROBE SYSTEMS
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E DIVISION OPERATING LOCATIONS
EUROPEAN FIELD OFFICE
Colonel David Lyster
VANDENBERG FIELD OFFICE
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ARMY BALLISTIC MISSILE AGENCY
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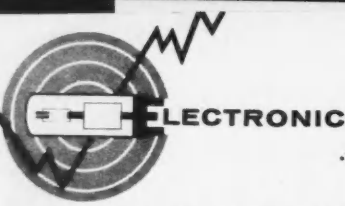
Use Tie Line or JE 6-4411, Ext. 4338
PACIFIC MISSILE RANGE
LIAISON OFFICE
Colonel G. S. Curtis
Point Mugu, California



REPUBLIC AVIATION STUDIES ELECTRIC POWER SOURCE

Plasma, a gas of electrons and ions, is seen by Republic A/C as future elec pwr source. Small plasma generators would light whole cities by shooting electrons and ions thru a magnetic field. ///Republic Aviation/

AMPEX CONTRACTED FOR FIELDATA COMPUTERS

All magnetic recording equip for Army's FIELDATA automatic data processing program will be supplied by Ampex Corp, under contract with Sig Cor R&D Lab, Ft Monmouth. Ampex will build engineering prototypes of 1) "ultra-reliable" computer-type tape transport, 2) data terminal tape transport, and 3) photo-elec paper-tape reader. ///Ampex Instrumt/

SYLVANIA WILL STUDY AUTOMATIC RADAR RETURNS SORTING

Rome Air Dvlpmt Center has awarded contract to Sylvania Elec Sys Inc for study of methods of classifying and tracking targets detected in ICBM defensive environment. Utilizing special purpose computer devices, study will devise a rapid automatic sorting of radar returns into tracks.///Elec Ns/

HELICOPTER RADAR

Bendix-Pacific has dvlpd a small, 75-lb radar sys for use on mil 'copters in low-flying ops. The elec "eye" is designed for night flying, bad weather and navigation between mountains and in canyons. Can be used for ground-mapping or measuring accurate distance to ground. ///Cross Country N/

LIQUID SCINTILLATION COUNTING SYSTEM

Baird-Atomic's carbon-14 and tritium liquid scintillation counting system, recently shown at the Federation Show, combines compact detector and an ultra-hi speed amplifier. Inexpensive, accurate and fast, the sys has complete compatability with many instrument combinations.///Baird Atomic/

ELECTRONIC COMPUTER TO CONTROL NAVY INVENTORY

The UHF broad-band scatter communication sys from Wash., D. C. to Hawaii via the moon will transmit 100-200 simultaneous radio teletype signals; pwrd by $20,000 klystron tube, 10 ft high with abt 170 kw and over 500 mc. In recent successful test klystron pwr was estimated at 20-million watts. Transmission is confined to 5-7 hr/day. Eitel-McCullough envisions trans-atlantic TV transmissions via the moon in 5 yrs.///Elec Ns 42059/

USSR CLAIMS WORLD'S FIRST HI-VOLTAGE ATOMIC BATTERY

Soviet scientists announce dvlpmnt of world's 1st atomic battery which can transform atomic energy directly into a 24,000-volt elec current. Battery said to have practically unlimited life and is suitable for many different applications. ///WP&TH 559/

ASW

"NIGHT EYES" SUCCEEDS IN ATOMIC SUB APPLICATION

First use of "night eyes" (originally dvlpd for Army tanks) helped Navy's atomic sub Skate on its trip to North Pole. The super-sensitive viewing device, mounted in a shock-proof container, gave the Skate crew a view of the ice above, enabling Skate to surface at points where there was no ice or thin ice. "Night eyes," described as one of the greatest advances in its field, is similar to a TV camera and was dvlpd primarily for tank fire direction against targets at night. ///DOD 379-59/

INTERNATIONAL ASW LAB

The SACLANT (supreme Allied Command Atlantic) ASW Research Center in La Spenzia, Italy will study and help solve antisub warfare problems to "secure the seas for use by the free world." ///DOD 429-59/

MODERNIZATION OF ANTI-SUB PATROL SEAPLANES

Navy has awarded $15,400,000 to Martin Co to modernize 28 P5M-2 anti-sub patrol seaplanes and install latest ASW detection equip. ///DOD 50159/

EVALUATION STUDIES OF REMOTE CONTROL ASW 'COPTERS

Gyrodyne Co's 9 unmanned anti-sub 'copters are being evaluated for use in dropping mines, atomic depth charges & lightweight homing torpedoes.

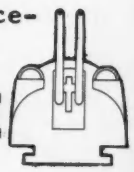
GROUND-PROXIMITY VEHICLES CONSIDERED FOR ASW PROGRAM

An experimental ground-proximity vehicle propelled by downward thrusts of air is being considered for use in ASW program as either a radio-controlled platform to carry searching and homing devices or as hunter-killer platforms to track and bomb enemy subs. ///Elec News 42059/

UNSOLVED SUBMARINE PROBLEM PRESENTS GREAT THREAT

Many research dollars will go into study of how to get radio messages underwater and—even more difficult—under the polar icecap. Sub under icecap is a "deaf mute," can't be reached by radio even in case of war.

ORDNANCE



AIA SEES CRITICAL SURPLUS PROBLEM

Disposal of surplus piston-engine airliners will become a critical problem within the next 6 months, says Aircraft Industries Assoc. AIA hopes that govt cooperation will speed eventual solution. ///AIA 59-24/

FAA EVALUATION CONTRACT

The 1st govt-sponsored program for eval of runway barrier sys for commercial a/c has been contracted to All American Engr by FAA. The 6-month program includes: 1) building and installing AAE Model 56 runway for commercial jets, 2) full-scale mockup of jet transport undercarriage, 3) series of barrier engagements to accumulate data. ///AAE 27459/

SINGLE-LEVER TRACTOR

A new British tractor enables control of all its movements by a single lever. Has no gearbox, clutch, differential, rear axle or brakes.

///Ltr from Ln/

MEDICAL TRAINING KIT

AF has dvlpd a simplified medical training kit which enables non-medical personnel to teach emergency medical care in 1/3 time previously required. Kit weighs 75 lb, costs abt $100 each when mass produced.

///DOD 451-59/

ARMY AWARDS 2ND M-14 CONTRACT

Harrington & Richardson, Inc will produce 35,000 lightweight M-14 rifles for Army under a $4,116,250 contract. ///DOD 448-59/

TWO AF GAPS TO FILL

USAF has recently reported special needs for: 1) a new a/c metal or alloy to withstand both sonic pressure and heat, and, 2) greater understanding of AF contractors of instrument calibration. ///DATA/

NEW CONDUCTIVITY TEST

AF reports dvlpmt of new conductivity test to determine best zinc concentration, film thickness and curing time for zinc coatings for steel.

PETROLEUM STORAGE CONTRACT

Western Terminal Co will build and own a petroleum storage and distribution plant in a $3,548,000 contract with Mil Petroleum agency. ///DOD/

MISSILE-FIRING TANK

Army has proposed a missile-firing tank which would fire offensive missiles, but would need a surface-to-surface anti-missile missile for defense against anti-tank missiles. //CV Vanguard/

HEAT REACTIVE TUBING

Minnesota Mining & Mfg has dvlpd a heat-reactive tubing said to shrink under heat to provide tight insulating cover for bars, tubes or rods.

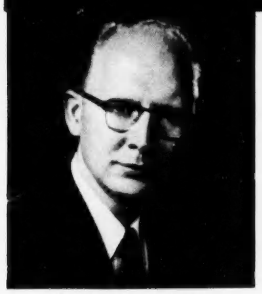
SAVANNAH LAUNCHING

The Nuclear Ship Savannah, world's 1st nclr-pwrd merchant vessel, will be launched 21 July 1959 at NY Shipbuilding Corp. ///AEC B-56/

LOW-THRUST INTERPLANETARY TRAJECTORIES STUDIED

In greater-than-critical acceleration interplanetary trajectories spiral to escape; in less-than-critical acceleration they move in precessing orbits with perihelion or aphelion on the initial orbit using outward or inward thrust, respectively. ///ARS Journal/

THE WASHINGTON REP REPORTS



ROBERT A. SWEET
Bendix Computer Division

JAMES S. MURRAY
American Potash & Chemical Corp.

DONALD W. WEIS
American Machine & Foundry

Question: *What areas of research or diversion are of interest to your company now for expected future profits five to ten years from today?*

Roy Field has been the Washington Representative for the radar firm GILFILLAN BROTHERS for 15 years. Prior to coming with Gilfillan Mr. Field was an Engineer.

We are mainly interested in solid state parametric amplifiers, concentrating on micro-modulization—that is, getting the size and weight down. It is a relatively new frontier and that's where the money is. We intend to carry on with these amplifiers past the research stage which has previously been in process.

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Robert A. Sweet is the Eastern Regional Manager for BENDIX COMPUTER DIVISION. Mr. SWEET became familiar with computers in the Navy before coming to Bendix three years ago.

We are interested in solid state circuitry (such as transistors) for laboratory, industry and commercial application. Solid state seems to offer more in speed and reliability, so much of our research is aimed toward utilizing new developments in this field. We are also interested in the systems approach, where the computer is one part of a project. This type of "online" operation will be of utmost significance. Bendix is also lookng to off-the-shelf items for general purposes rather than R&D. Computers are already a going thing in the military and are now being pushed into commercial applications.

****

James S. Murray has been with AMERICAN POTASH AND CHEMICAL CORPORATION and its affiliated organizations for 13 years. He is at present the Director of the Washington Office. Mr. Murray worked for several years in the atomic energy field before joining American Potash & Chemical.

American Potash is putting its research dollars into investigations relating to high energy fuels and propellant chemicals, high temperature materials and fluids, the metals and salts of manganese, lithium, sodium, potassium, rubidium, cesium, the rare earths, yttrium and thorium, and organoboron, organo-silicon and organophosphorus chemicals. It is also improving existing products and processes.

****

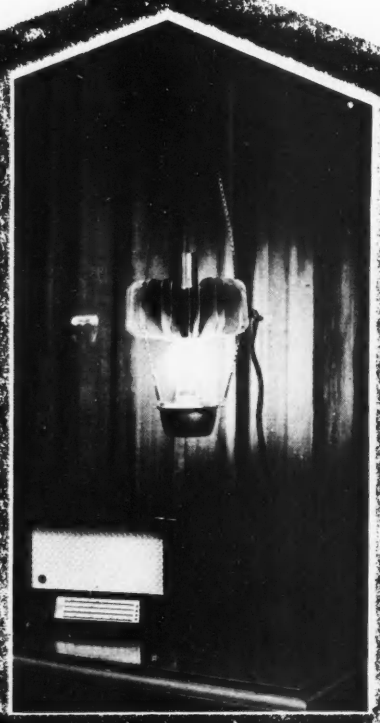
Donald W. Weis is the Assistant Manager of Planning and Programs for AMERICAN MACHINE & FOUNDRY. Mr. Weis has been with American Machine for four years. Before that he was engaged for six years in the Navy missile program.

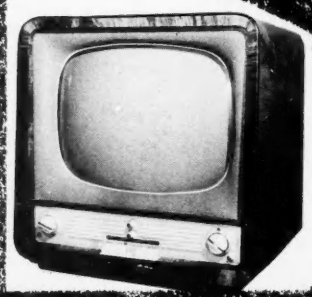
American Machine & Foundry has programed a balanced proprietary research endeavor in several key government market areas over the next few years. For the Navy, a considerable effort in ASW detection and classification is underway. A new approach to prime movers and power distribution within vehicles is being explored for Army interests, and a missile launcher standardization study is being prepared for AF usage. In the non-governmental area several key fields are receiving planning and proprietary dollar support for longer range payoff. Among these are solar energy, factory automation, water processing and devices for the leisure time industry. This program of diversified research in selected areas is in accord with the overall corporate structure of business group activity. •

SOVIET R & D

This month we received some more material from the Press Department of the Soviet Embassy. These photos which hav not been published in other U.S. publications, are reproduced for you here. The Press Department hopes to declassify a large group of Soviet missile photos for one of our coming issues.

SOVIET COMMERCIAL ELECTRONIC PRODUCTS FOR HOME USE





TRANSISTORIZED PORTABLE LOOKS LIKE BOOK

Miniature radio set seen in the hands of Alexander Seryogin, a Moscow engineer, looks like a book and weighs 800 grams. Semi-conductors contributed to the smallness of its size. On opening the back cover of the "book" you would find 8 transistors. These triodes are powered by a 4.5 volt flashlight battery. Next to the battery is an internal magnetic aerial made of a new alloy, *ferrite*. The set operates on the 187-577 meter bands.

RADIO RUNS ON ELECTRICITY FROM KEROSENE LAMP

With the great interest U.S. has on production of electrical power from heat, Russians point with pride to their *thermoelement battery* which is said to be in wide spread use in rural areas. The *thermoelement battery* on top of the kerosene lamp uses its warmth to produce electric current. The battery's 7% efficiency is quite enough to power the radio.

SOVIET TV USES GERMANIUM TRIODES AND DIODES

Similar in appearance to some American television sets, this Russian brand is called "The Rubin TV" and differs only slightly in construction. Germanium is used in all amplifiers (triodes) and rectifiers (diodes).

RUSSIAN PORTABLE

This Russian portable is called the "Surprise" and works on long and medium wavelengths. The Chassis has 7 transistors and is powered by 2 flashlight batteries.

REPORT OF THE UNDERSEAS WARFARE ADVISORY PANEL

continued from page 8

The Soviet ocean surveying effort at the present time exceeds ours by at least threefold. Greatly increased United States effort is needed, utilizing known survey methods.

A committee of the National Academy of Sciences has estimated that accomplishment of the most essential surveys within a 10-year period would involve 15 to 30 deep sea vessels at a totat cost of 20 to 30 million dollars a year. With adequate funds, much of this work could be conducted by the surveying agencies of the Federal Government, such as the Naval Hydrographic Office and the Coast and Geodetic Survey.

Oceanographic surveys should, of course, be distinguised from oceanographic research - the study of the fundamental properties of the ocean's waters and its bottom. An accelerated oceanographic research program is no less needed than a stepped-up survey program.

4. Compact Nuclear Reactors

The naval reactors program has been an outstanding success. We will soon have in being an entire family of nuclear propulsion units, ranging in size and shaft horsepower from plants for hunter-killer submarines to plants for a large aircraft carrier. Our program aims at introducing highly reliable and combat-worthy reactors into the ships of our fleet at the earliest possible date.

With existing technology, the employment of nuclear power plants is limited to submarines of more than 2,000 gross tons, and to surface ships larger than conventional destroyers. The need for dispersed units in the age of nuclear weapons, to say nothing of matching Soviet numerical superiority, aruges for the desirability of relatively small naval ships. But, if such ships are to be nuclear propelled, they will need much smaller and lighter powerplants than can be constructed today. To build such plants, in turn, we must learn far more than we now know about reactor technology in general, and reactor materials in particular.

The technical difficulties involved in building compact powerplants are formidable. They apply not only to the reactor portion of the plants, but also to the associated propulsion equipment. Radical improvements in nuclear propulsion are not now in sight.

To the extent that technically worthwhile programs in this area can be devised, however, we should accelerate and broaden the scope of research and development projects specifically aimed at reducing the size and weight of nuclear propulsion powerplants for naval application.

5. Experimental Ships

Progress in airplane design has involved a continuing program of constructing experimental aircraft. The Navy, however, has rarely built experimental ships. A program of design and construction of such ships, in order to study their performance characteristics and operational potentialities, should yield very large returns. Such a program might include different true submarines (rather than submersibles) capable of much higher speeds than present submarines - for example, heavier than water submarines using controllable planes to maintain depth.

Likewise, design and construction of submarines capable of operating at depths of several miles might open up many new tactical possibilities.

In addition to a stepped-up applied research and development effort, it is essential that the Navy increase its support of basic research. There must be more emphasis on scientific fields of concern to the Navy, such as materials, oceanography, and meteorology.

We cite one example of needed basic research: There are many properties of the ocean's floor and the ocean's water for which present survey methods are inadequate. These include measurement of deep sea currents, acoustic properties of the water, and acoustic and magnetic properties of the bottom. Far more basic oceanographic research at universities, industrial and Government laboratories will be needed to develop new surveying methods, and to use survey results most effectively.

Responsibility for the Navy's basic research program has been magnificently handled by the Office of Naval Research. But the 'level budgeting' of ONR support during the last eight inflationary years has tended to reduce the number of basic research scientists because of the lack of job opportunities. At the same time, heavy emphasis on development by all the military services has tended to draw college graduates at the bachelor's level away from graduate research training in university laboratories.

We estimate that under the right conditions, the number of creative research scientists working in basic fields of relevance to the

Navy could be increased by at least 10 percent per year, provided there were a corresponding increase in financial support for basic research. A considerably larger immediate increase is necessary to overcome the decline of the past few years.

The real limiting factor in basic research should be the availability of qualified personnel and institutions, not lack of funds.

We recommend that the Navy's research and development budget for systems immediately relevant to undersea warfare be at least doubled in fiscal year 1959, and substantially and continually increased thereafter.

We recommend that there be a substantial and continuing increase in the Navy's budget for basic research not immediately related to operational requirements. The funding of both basic and applied research should be determined by the availability of qualified scientists and institutions, and should be designed to stimulate the continued orderly growth of universities, private research centers and industries which can contribute to the solution of our long-range problems in underseas warfare.

We recommend that basic oceanographic research in particular receive increased support.

We recommend that the appropirate committees of the Congress give serious consideration to increasing the moneys available for oceanographic survey work, both on the high seas and in distant coastal areas.

We recommend that the Navy, as soon as possible, move to employ far more fully than in the past, the resources of universities, private research centers, and industry for carrying out both basic and applied research on undersea warfare problems.

VI. OUR SUBMARINE CONSTRUCTION PROGRAM

Of the 110 submarines now in our active fleet, 3 are nuclear powered and the rest are diesel powered. Less than 15 vessels have been built since World War II.

In contrast, the Soviets have built over 300 submarines since the end of the Second World War, and their force now consists of about 475 submarines.

The element of concealment gives submarines a tremendous advantage over surface ships. As a matter of policy, we should move toward employing submarines for as many naval missions as they can perform.

It is almost certain that the nuclear submarine will become more and more important in naval warfare - defensively, in ASW and escort operations, and offensively, in attacks on shipping and Polaris-type systems. In addition, the submarine may come to be of great value for close support work in brush fire wars, in remote areas where an enemy might posses local air superiority.

We regard it as likely that the Soviets can soon have the capability of building many more nuclear submarines than we now planto construct. The record of Soviet performance both in building convential submarines and in other military-scientific-industrial endeavors, leaves little room for doubt on this score. In fact, assuming a continuation of our present and planned construction program, we regard it as probable that the Soviets will have it within their capability to build a larger nuclear submarine fleet than our own by the mid-1960's.

Our present building program calls for 13 nuclear-powered attack submarines to be in operation by the end of 1960. Four or five of these could be kept on station at any one time. In 1960, therefore, we would have only 2 or 3 nuclear attack submarines on station in the Atlantic, and a corresponding number in the Pacific.

We understand that the Navy now plans to build about 50 additional attack submarines during the decade 1960-70. By an attack submarine, we mean a vessel designed specifically to hunt down and kill enemy submarines. Making allowance for the obsolescence of our conventional submarines, this means that in 1970 there would be in operation 65 nuclear-powered attack submarines and about 10 diesel electric craft. Of this total force, only 12 to 15 submarines could be on station in the Atlantic, with a matching force in the Pacific.

Keeping the largest possible number of submarines on station is of course a problem of prime importance. We do not believe that our present system of force deployment takes maximum advantage of our submarine fleet in this respect, and we urge that the Navy intensify its studies of ways and means of keeping a larger proportion of our submarine force on station.

Apart from this, however, we believe that our present and planned goals for the construction of attack submarines are too small.

Projected construction goals for Polaris submarines are not yet firm. We understand, however, that the Navy now thinks in terms of 40 such submarines being in operation by 1970.

The eventual size of our Polaris force is a question which will require constant re-

examination, in the light of the comparative military worth of the Polaris versus alternative deterrent systems.

The problem of the ultimate composition of our Polaris force, however, is not the practical question confronting us today. The real problem at this time is building Polaris submarines in such number and with such speed that we secure as quickly as possible the beginnings of a sea-based deterrent of significant dimensions.

It is our understanding that the Navy's immediate plans call for the construction of five Polaris submarines. It is also our understanding that the Polaris fleet of the future will consist of multiples of task units of nine submarines each.

It is our belief that it would be desirable to proceed immediately with the construction of one such complete task unit.

We recommend that the rate and scale of our attack submarine construction program be significantly increased.

We recommend that the Navy immediately proceed with the construction of an initial task unit of nine Polaris submarines, and that authorization and appropriations for this purpose be requested of the present session of Congress.

VII. FUNDING FOR POLARIS SUBMARINES

Funds for construction Polaris-type submarines will come out of the Navy's regular shipbuilding budget. This appropriation covers the construction of carriers, cruisers, frigates destroyers, tenders, mine sweepers, and all other vessels employed by our Navy.

A Polaris-launching submarine is thus treated fiscally like any other naval vessel. In terms of its military mission, however, it is radically different from other ships in the fleet. Actually, the Polaris system is part of our national military deterrent against all-out war. It is an instrument of strategic reprisal. It is more analogous to a SAC bomber or a land-based IRBM or ICBM, than to other ships of our Navy.

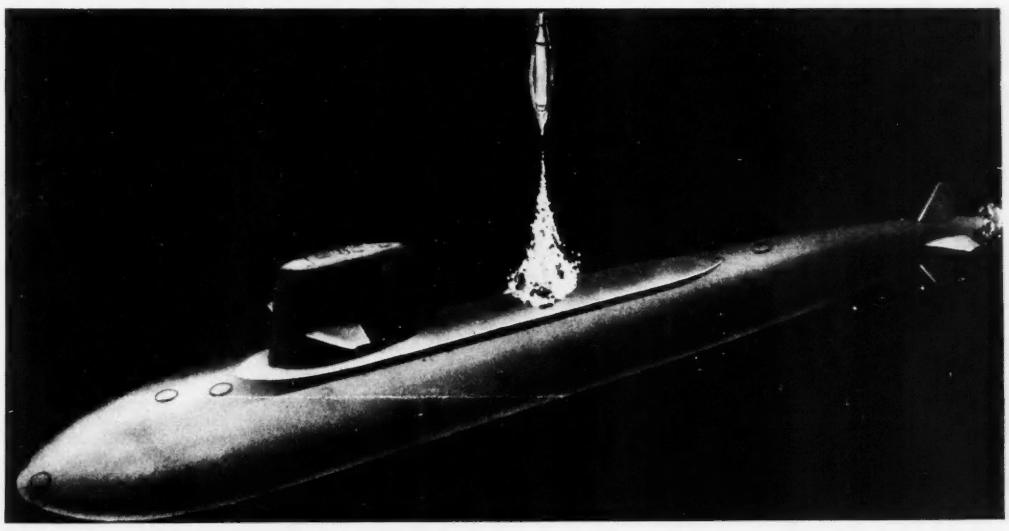
Under existing funding regulations, Polaris submarines must compete for money with the rest of our shipbuilding program. This total construction budget is limited. Even if none of this money were spent on Polaris submarines, the funds would be stretched to the limit in meeting the Navy's minimum requirements for its traditional mission of controlling the seas.

From the standpoint of national deterrent strategy, the Polaris system should therefore not be treated as part of our regular shipbuilding program. In assigning money and priority to it, this system should be compared, not with other naval ships, but with the manned aircraft and land-based strategic missiles of our national deterrent force.

We recommend that, for funding purposes, the Polaris system be entirely removed from the Navy's shipbuilding budget.

We recommend that construction budget requests for the Polaris system be determined by the Secretary of Defense and the National Security Council, as part of our overall strategic deterrent budget.

The Polaris, atomic submarine



VIII. NUCLEAR ARMAMENTS AND UNDERSEA WARFARE

The lethal destructive radii of nuclear depth charges and torpedoes would appear to make atomic weapons highly effective armaments for an ASW force. On the face of it, they reduce the problem of localizing the enemy and permit less stringent guidance requirements on ASW weapons.

Nuclear armaments, however, place more exacting demands on target recognition, and there is some evidence suggesting that underwater nuclear expolsions may affect the operation of the detection and identification devices now employed for ASW work.

In the 13 years since Hiroshima, our country has detonated many nuclear devices or weapons for test purposes, but there have been only a few underwater shots, which yielded limited amounts of information. Two more underwater tests are scheduled for the current Eniwetok series. They do not promise, however, to produce all the data needed properly to evaluate the role of nuclear weapons in ASW.

It is important that we secure more authoritative information through additional tests of the effects of underwater nuclear weapons. Such tests would also have a vital bearing on the design of new nuclear weapons and the tactical employment of submarines in all types of operations. They would, in addition, furnish data about possible hazards from radioactive contamination of food fishes.

We are not persuaded that we have in the past moved with sufficient vigor and imagination in developing nuclear weapons specifically optimized for undersea warfare. Nor are we certain that the weapons now being stockpiled or developed for ASW work take full advantage of the contributions which nuclear armaments can potentially make to destroying enemy forces.

We recommend that the Navy and the Atomic Energy Commission increase their efforts to develop new nuclear weapons specifically optimized for underseas warfare.

We recommend that the Atomic Energy Commission and the Department of Defense perform such additional underwater tests shots as are needed to augment weapons effects data, to increase weapons efficiency, to improve ship design, and to minimize the size and yield of weapons required for ASW work. Such tests should be of course performed in a manner consistent with keeping radioactive contamination and fallout to a minimum.

IX. WEAPONS SYSTEMS MANAGEMENT

The bureau system of the Navy was established at a time when naval technical problems were easily defined and separable. This system provides for independent control under chiefs with the rank of rear admiral. These billets represent the highest technical posts in the Navy.

To a large extent, the bureaus are staffed with personnel whose chief career goal is line responsibility within fleet commands and the Office of the Chiefs of Naval Operations, rather than promotion in technical grades.

It has been demonstrated repeatedly that the bureau system has shortcomings in the present area of highly integrated and complex weapons systems.

These shortcomings assert themselves both in overall management and in technical decision making.

However, the admitted strength of the bureau system should be preserved until a better alternative is evolved. A precipitate departure from this system could cause unacceptable disruption.

In the meanwhile, a study should be made of manning within the technical bureaus, to make sure that technical decisions are made by properly trained selected civilians or technical officers. Promotions of technical career officers, moreover, should be consistent in scale and rank with those of line officers.

We regard it as more important to make a limited number of critical weapons systems available to the fleet on time than to coverall possible systems inefficiently and too late.

To this end, we believe that such vertical organizations of the type now used for management of the Polaris program would be useful for other high priority projects. This type of vertical management is most successful for engineering projects - systems programs which appear to be technically feasible within foreseeable advances in the state of the art. This type of management is not generally suitable for basic or long-range applied research. Also there is a distinct limit to the number of vertical organizations which can be operated at any one time, and the value of this system quickly declines once this number is exceeded.

We recommend that a limited number of vertical management organizations, under officers reporting directly to the Chief of Naval Operations and the Secretary of the Navy, be established for such projects as ocean surveillance systems and attack submarine systems.

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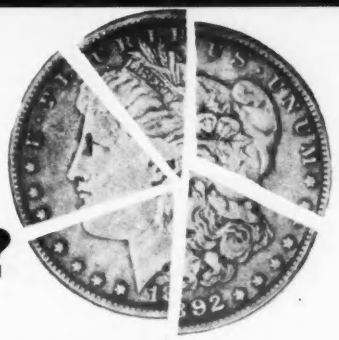

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